

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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The Measurement of the Pressure in the Right Auricle (a New Clinical Method).—GUSTAV GAERTNER (*Münchener med. Wochenschrift*, 1903, No. 47). Gaertner's method depends upon the well-known fact that when the arm hangs by one's side the veins fill with blood, which empties out when the arm is raised. This Gaertner calls the "vein phenomenon." It occurs normally when the vein to be tested in the arm is raised to the level of the costal insertion of the third, fourth, or fifth rib. Gaertner argues that the occurrence of the "vein phenomenon" is dependent upon the pressure in the right auricle. The veins form manometers, which, although not transparent, indicate the position of the blood column. A slight positive pressure suffices to distend their walls, while they collapse if the pressure is zero or negative.

He recognizes two limits: 1. The elevation of the arm at which emptying of the veins just occurs. 2. The elevation of the arm at which the veins just do not collapse. Of these only the first is important. The pressure in the right auricle is measured by determining the vertical distance between the level of the right auricle and the level of the vein examined. The pressure in the right auricle is subject to rhythmical variations. It rises during systole and sinks during diastole, and varies with inspiration and expiration. The veins of the arm constitute, as it were, a "minimum manometer."

By adjusting the arm at the proper height, Gaertner observed pulsation in the veins in cases of mitral disease, and in cases of dyspnoea. A voluntary increase of pressure in the right auricle can be produced by forced expiration when one holds the nose (Valsalva experiment).

He found that the pressure in the veins is not identical with the pressure in the thorax. By increasing the pressure in the thorax artificially to the equivalent of 10 cm. of water, the pressure in the auricle rose only about 6 cm. With an increase of 15 cm. in the thorax the auricular pressure rose only about 11 cm. He noticed the curious fact that negative pressure in the thorax produced no diminution, but actually an increase of pressure in the auricle.

Gaertner had an opportunity to test the pressure in a number of patients in Prof. Neusser's clinic.

His experiments showed that in all cases, without exception, in which there was congestion of the right heart he was able to demonstrate by his method an increased auricular pressure. The difference from the normal was naturally dependent upon the nature of the case. In almost all cases it was so material a difference as to be readily recognized. Usually in healthy people the veins collapse when the hand is at or below the level of the shoulder; some cases when it is raised to the level of the eye or top of the head. He designates the auricular pressure as V. D. (Vorhofsdruck). He took as his standard the upper border of the fifth rib. He found that the pressure varied from 9 cm. to 23 cm. In the case of pericarditis about 20 cm., in lung emphysema about 18 cm., in lobar pneumonia 29 cm. He found also increase of pressure in tuberculosis, pleural exudation, and so on. The highest pressure was 37 cm. in an individual with beginning infiltration of the apices of the lungs. In this last case a satisfactory explanation of the pressure was not found.

He records the varying changes of pressure in the infarct of the lungs that was observed very early.

At times the increased auricular pressure was the only objective symptom that indicated damaged circulation. In one case the pressure was 20 cm. in a woman, aged about forty years, in whom the investigation of the heart and lungs gave no signs of disease. Clinical history, however, showed that there was cardiac insufficiency.

In describing his method, Gaertner suggests that changes may be required after further experiences. The determination is best made with the patient sitting upright. The back should be supported in order to prevent alterations of the position during the determination. With fat people or with those with abdominal tumors, ascites, etc., the feet should rest on the ground, since when sitting in bed the abdominal pressure produces circulatory changes. Thin patients could be measured even while sitting in bed. The anterior plane of the thorax should be as upright as possible. In semirecumbent position the determination is more difficult. The chief difficulty occurs when one attempts to determine what point must be selected as the normal zero point. At first he was inclined to select the upper limit of heart dulness; but he later concluded to select a point on the skeleton, and chose the sternal insertion of the upper border of the fifth rib. This is easily demonstrable, and there can be no question of its position, while there might be controversy about the limits of cardiac dulness. Furthermore, this point corresponds in healthy human beings to the level of the tricuspid valve. Finally, the horizontal plane that passes through this point is to be regarded, according to his observations, as the lowest limit at which the vein phenomenon occurs. In all cases, then, one will obtain a positive value for V. D., while if a higher point be selected the value for V. D. may be either positive or negative. It may be said that the auricle in diastole forms a space 6 cm. to 8 cm. in vertical measurement, so that in the auricle itself there must be differences of pressure according as the measurement is at the top or bottom of the auricle, and by selecting the lowest point of the auricle, that is, the tricuspid valve, as his zero point, he always obtains a positive value for his auricular pressure.

Having determined that one will select the lowest plane of the auricle for the measurements, it remains to determine where this lowest point falls. It would be simple to determine this matter by means of

Roentgen-ray pictures, but this is a complicated procedure. For practical diagnostic purposes such exactness is superfluous, for in pathological cases the extent of the pressure is so far from the normal that it is readily perceived by less exact means.

Of the veins that may be selected for examination, those of the back of the hand and the radial surface of the forearm are the most suitable. At times these are not available, and any vein that presents must be selected, such as the median basilic. It is rare in adults that no vein occurs available for this determination, though this is common among well-nourished children.

Under the action of cold the veins become invisible; the use of warmth in any form, however, quickly restores the circulation to the skin and brings out the veins. One must select a vein that collapses readily. On the backs of the hands of old people it is not uncommon to find thickened varicose veins which do not collapse. Exceptionally, such veins occur also on the forearm and upper arm. The collapse of even the most delicate vein is sufficient for the determination. A good illumination and a suitable position of the observer are essential for this. If the eye of the observer is a little bit higher than the vein and if the light comes over the shoulder of the observer, one can see the shadows cast by the rising vein over the congested skin and can determine the moment of collapse by the disappearance of the shadow. Of course, one must be careful that articles of clothing do not interfere with the circulation and must be sure that the handling of the arm does not occlude any of the veins. The person examined must not hold his breath; the arm examined must not be too sharply bent at the elbow, at the most about 120 degrees; nor should the arm be everted from the shoulder.

Before beginning the final determination, let the arm hang vertically and wait until the blood column accumulates to the shoulder after two or three minutes. Then bend the arm, held in adduction to an angle of 120 degrees at the elbow and pronated. The forearm must be raised from the shoulder so that the whole forearm stays horizontal. In this case the collapse occurs simultaneously in the whole extent of the forearm. The movements must be executed by the physician with care not to compress the vein. The muscles of the person examined must be as relaxed as possible. Several determinations must be made, preferably using both left and right arms. Often the first determinations are higher than the later ones, as the patients are frequently somewhat excited by the examination. Once Gaertner observed a very great increase of pressure after only very slight muscular exertion in the case of a patient with mitral disease. The determination of the difference of level between the auricle and the observed vein can be either approximate or accurate. According to the first method, one roughly measures the height of the vein at the point of emptying and projects it upon the median plane of the body, and in this way finds how much above the given zero point the collapse occurs. It is much more accurate to measure this pressure in centimetres, which Gaertner does with a simple apparatus that he describes.

The first objection that may be raised is that he is obtaining hydrodynamic relations and not hydrostatic, and second that the pressure in the peripheral vein is modified by a suction action where the small vein empties into the jugular. Third, that the elasticity of the vein walls modifies the result.

He also made determinations using the veins in the foot and leg

He thinks that a comparison of the results given on the upper and lower extremities gives us a means of determining intra-abdominal pressure. His conclusions are as follows:

1. An observation of the "vein phenomenon" puts us in a position to determine the pressure in the right auricle in a manner beyond objection, as far as the laws of physics are concerned.

2. By means of the method here described we can recognize the presence of congestion in the right heart not only with certainty, but actually can measure the degree of injury and follow the course of alterations. We will be able to follow very accurately the limits of therapeutic measures.

3. The method is so simple, the appearance is so unmistakable that its application will recommend itself for diseases of the circulation and respiratory organs.

OSKAR PRYM (*Münchener med. Wochenschrift*, 1904, No. 2, p. 60) raises several objections to Gaertner's method which was recently proposed. Having tried this method repeatedly in the clinic at Bonn, he finds: 1. The vein phenomenon occurs in the same individual at unequal heights in different veins; the difference amounted to 6 cm. or 8 cm. or more. 2. There was often a rapid change in the height at which the vein phenomenon occurred, which depended apparently upon the rapidity with which the arm was raised. With more rapid raising of the arm the vein phenomenon occurred at a greater height. 3. On account of the influence of varying pressure and varying volume of blood passing through the veins, and on account of the varying tonus of the veins, he concludes that the vein phenomenon does not always indicate either the lowest pressure in the right auricle nor the highest pressure. The vein phenomenon may indicate either too high or too low a pressure. He thinks it not allowable to regard the veins as simple manometers, for the height at which the vein empties is dependent not only upon the pressure in the right auricle, but also upon the amount of flowing blood, upon the resistance to the outflow, and upon the tonus of the vein. He thinks that Gaertner's method may be of use clinically if these factors are borne in mind.

SURGERY.

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The Treatment of the Congenital Dislocation of the Hip.—REINER (*Centralblatt f. Chir.*, 1904, No. 2) considers this subject under two separate headings: first, radical treatment in relation to the age of the patient, and, second, the after-treatment. The method of Schlesinger,